

EFFECT OF SUPPLYING NUTRIENTS THROUGH ORGANIC MANURES, INORGANIC FERTILISERS AND THEIR COMBINATION ON ARECANUT CROP*

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ABSTRACT

The source of nutrients supplied did not influence plant growth or yield of the crop. The plots that did not receive organic manures from outside had organic carbon in soil around 0.7%. The level of nutrients supplied per palm per year (100g N, 40g P₂O₅ and 140g K₂O) can be considered adequate for the local cultivar of arecanut as indicated by the build up of P, K and organic carbon in the soil and almost uniform levels of available nitrogen in the soil around root zone.

INTRODUCTION

Arecanut (*Areca catechu* L.) is cultivated in acidic low to medium fertility soils. Under tropical cultivated conditions destruction of soil organic matter is rapid and replenishment is necessary. The organic manure is considered as essential in all intensely cultivated arecanut gardens of Northern Kerala and Coastal Karnataka; where high productive areca gardens are seen. No attempt had been made to study the effect of supplying nutrients solely through fertilisers as compared with the traditional method of applying only organic manures or combination of organic manure and inorganic fertilisers. This paper is the result of this investigation.

MATERIALS AND METHODS

The 'South Kanara' cultivar arecanut seedlings were used in the experiment.

To get maximum uniformity, seedlings raised from nuts of single bunch were used for planting one replication. The experiment consisted of six treatments and four replications. Each treatment, had 8 plants with common border. Square system of planting with spacing of 2.7m was adopted. Seedlings of 1½ year having uniform morphological growth were used. Usual method of digging 1 cm cube pit filling it half and planting was adopted. Adequate drainage was provided during monsoon and irrigation in rainless summer months.

Treatments:

1. Application of organic manures
2. Application of inorganic fertilisers
3. Application of organic manures + inorganic fertilisers
4. Treatment No. 3 + cultivation
5. Treatment No. 1 + cultivation
6. Treatment No. 2 + cultivation

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Cultivation means light forking with mammatty fork once in a year in October (after heavy s.w. monsoon). Per palm per year the following nutrients were supplied.

Nitrogen	100 g
P ₂ O ₅	40 g
K ₂ O	140 g

Source of nutrients

a) *Fertilisers:*

Calcium ammonium nitrate (CAN) to supply N
Super phosphate to supply P₂O₅
Muriate of potash to supply K₂O

b) *Organic manures*

Combination of green leaf and cattle manure to supply N
Bone meal to supply P₂O₅
Wood ash to supply K₂O

Time, method and rate of application:

The organic manures were applied in one single dose in October. When seedlings were young (up to three years from planting) manuring was done in pits. When the pits were filled basins, 1 m radius to a depth of 20 to 25 cm were opened manures/fertilisers were applied and covered with the soil. The fertilisers were applied in two equal split doses. One in October and the other in January-February. During the year of planting 1/3 the full dose, during the second year 2/3 the full dose and from the third year onwards full dose of nutrients was supplied.

During October, each year annual morphological data i.e. number of leaves, diameter at collar, total height, and number of nodes formed were recorded.

Table I. *Nutrient concentration in Arecanut leaves during different years. Mean values.*

Year	N%	P%	K%
1970	1.69	0.14	0.87
1971	1.80	0.15	0.74
1972	2.00	0.10	1.46
1973	1.94	0.19	1.36
1974	2.40	0.16	0.78
1975	1.88	0.17	0.79
1976	1.92	0.20	0.79
1977	2.15	0.18	0.76
1978	1.87	0.16	0.81
1979	1.97	0.16	0.91
1980	1.86	0.16	0.80

The soil and leaf samples were collected prior to manuring analysed by usual methods.

RESULTS AND DISCUSSION

From 1970 onwards (one year after planting) leaf samples were collected and analysed. During the experimental period (Table I) there were no significant difference between treatments.

The soil samples collected were also analysed every year. There was no significant difference between treatments during any of the years. The mean values for the different years are presented (Table II).

Morphological data recorded annually did not show any significant difference between treatments (Table III).

The first harvest of ripe arecanuts was got in 1973-74. From then ripe bunches were harvested as and when they became fully ripe. The annual yield (June 1 to May 31) was compiled and data

Table II. Soil analysis data from arecanut basins during different years (Mean values).

Year	Depth of sample		pH		Organic carbon %		Available N ppm%		Available P ₂ O ₅ ppm		Available K ₂ O ppm	
	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm	0-50 cm	50-100 cm
1969	6.06	6.02	0.63	0.51	132.9	122.0	5.23	5.36	120.3	122.0		
1970	5.50	5.69	0.68	0.61	122.2	111.9	2.57	4.11	87.6	120.8		
1971	5.94	6.24	1.21	1.30	141.8	142.0	6.54	16.60	56.0	85.0		
1972	5.03	5.51	1.53	1.25	138.0	137.0	13.00	11.66	113.0	150.0		
1973	5.85	5.98	1.05	0.73	159.3	133.1	27.86	13.68	75.1	76.9		
1974	6.09	6.10	1.04	0.79	175.0	163.0	17.80	10.60	123.0	86.0		
1975	6.55	6.18	1.40	0.80	132.5	105.0	50.30	21.00	163.0	85.5		
1976	6.70	6.23	1.29	0.80	131.5	102.9	63.80	21.90	159.4	88.0		
1977	6.64	6.24	1.29	0.79	131.5	103.0	47.80	19.20	160.0	87.8		
1978	6.35	6.16	1.11	0.61	160.0	129.0	66.00	13.00	157.0	100.0		
1979	6.35	6.08	1.43	1.13	143.0	105.0	90.00	22.00	162.0	77.0		
1980	6.54	6.39	1.24	0.86	144.5	110.0	110.0	32.00	193.5	107.3		

examined. Yield differences between treatments were not significant between

Table III. Morphological data of different years of arecanut palm (Mean values).

Year	Number of leaves	Girth at collar (cm)	Total height (cm)	Number of nodes
1970	5.08	5.72	184.6	-
1971	6.47	26.64	243.7	3.37
1972	8.41	53.82	357.9	6.35
1973*	8.05	38.30	483.1	12.77
1974**	8.40	40.82	174.1	13.57
1975	9.23	40.46	263.3	16.66
1976	9.40	39.80	342.3	28.02
1977	9.50	40.80	422.0	35.04
1978	9.40	38.30	502.0	39.50
1979	9.80	38.00	622.0	51.50
1980	9.70	40.30	684.0	62.40

Note:

*From 1973 onwards girth at the last exposed node was recorded

**From 1974 onwards the height was measured from a permanent mark given at the base of stem up to the last exposed node

treatments during any of the year. The yield data of ripe arecanuts during different years is presented in Table IV.

The first harvest was taken in the fifth year after planting and minimum variability was obtained in the tenth year. This shows that the 'Vittal' arecanut palms reach yield stability from the tenth year.

Table IV. The cumulative yield data of ripe arecanuts (Number of arecanuts).

Year	Yield of ripe fruits (No.)	Number of trees yielded	Mean yield per tree (No. of fruits)	C.V. % for years
1974-75	4759	70	58	91.5
1975-76	18245	145	121.0	39.3
1976-77	52319	175	255.0	23.3
1977-78	35263	181	193.0	27.8
1978-79	34215	178	189.0	25.4
1979-80	62099	187	331.0	20.4
1980-81	52988	184	286.0	21.3

Table V. *Nutrient composition of weed growth and nutrient added per palm per year.*

Nutrient element	Nutrient composition %	Nutrient added per palm per year in 14 kg fresh weed
Nitrogen (N)	1.83	32 g
Phosphorus (P ₂ O ₅)	0.39	7 g
Potash (K ₂ O)	3.00	52 g

The plots receiving organic manures and plots receiving chemical fertilisers showing no significant difference in soil organic matter and soil pH can be explained. To avoid the accounting for the nutrients removed by weed growth we planned scything of weed growth as and when it grew and retained it in situ to decompose and get incorporated to the soil. Because of favoured condition of light and moisture inside the plot there was luxuriant weed growth which was cut and allowed to get incorporated to the plot. This is why there was no significant difference between soil organic carbon content of plots receiving organic manure and those that did not receive. For supplying nitrogen in chemical fertiliser

calcium ammonium nitrate was used which is a non acid forming fertiliser. The application of fertilisers did not bring down soil pH.

During the experimental period of 2 m² area between the palms inside experimental plot was cut and yield of fresh plant growth was weighed. On an average a 2 m² area gave 6.86 kg fresh weed growth. This works out to 17 tonnes per hectare. Assuming only half the area inside the areca garden is available for weed growth (The base of palms, irrigation and drainage channels left out). We have 8.5 tonnes of weed growth in one cutting from one hectare of pure areca garden. From June to October two loppings/cuttings could be got. Thus we have 17 tonnes which gives 14 Kilograms of green matter per palm. The mixed fresh weed growth had 12% dry matter and had the following nutrient content (Table V). Managing the weed growth and getting it incorporated will substantially supply nutrients required by areca palms, besides enriching soil with organic matter. There is no need to eradicate the weeds either by weedicide spray or by hand weeding. These weeds grow luxuri-

Table VI. *Nutrient content and quantity of nutrients added by non marketed produce in arecanut garden (per palm per year).*

Name of the bye-product	Mean dry wt. of biomass Per yr/palm	Nutrient tent%			Nutrient added per yr/palm in grams		
		N	P	K	N	P	K
Arecanut shed leaf	4.0 kg	1.59	0.16	1.01	63.6	6.4	40.4
Leaf sheath	1.7 kg	0.66	0.08	1.51	11.2	1.4	25.6
Arecanut husk	1.7 kg	1.00	0.12	2.40	17.0	2.0	40.0
Arecanut bunch	0.3 kg	1.04	0.07	1.10	3.1	0.2	3.63
Total nutrients added					94.9	10.0	109.63

antly with the rains and cover the soil thus almost completely checking soil erosion.

In any sound crop management and soil fertility, recycling is very important. This implies that we return to the soil as much as possible from the crop harvested. In arecanut cultivation, shed leaves, arecanut husk, arecanut bunches (inflore-

scence after separating ripe arecanuts) are non marketed produce. The nutrient content of these were estimated and the same is given in Table 6.

It is clearly brought out that by incorporating weed growth of areca garden and non marketed produce obtained from the crop, major portion of plant nutrients required by the crop can be met.